

(19)



(11)

EP 3 358 157 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
31.03.2021 Bulletin 2021/13

(51) Int Cl.:
F01M 11/02 ^(2006.01) **F01M 13/04** ^(2006.01)

(21) Application number: **18150526.4**

(22) Date of filing: **08.01.2018**

(54) **AN ENGINE HOUSING COMPONENT**

MOTORGEHÄUSEKOMPONENTE

COMPOSANT DE CARTER DE MOTEUR

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

(30) Priority: **07.02.2017 GB 201701993**

(43) Date of publication of application:
08.08.2018 Bulletin 2018/32

(73) Proprietor: **Ford Global Technologies, LLC**
Dearborn, MI 48126 (US)

(72) Inventors:
• **DEMEULENAERE, Xavier**
London, E3 2UF (GB)

• **SLAUGHTER, Graham**
Brentwood, Essex CM15 0LT (GB)
• **MICHEL, Mark**
Dartford, Kent DA2 6LX (GB)

(74) Representative: **Haseltine Lake Kempner LLP**
138 Cheapside
London EC2V 6BJ (GB)

(56) References cited:
EP-A1- 0 599 095 EP-A2- 1 467 069
FR-A5- 2 075 754 US-A1- 2008 011 264

EP 3 358 157 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

Technical Field

[0001] The present disclosure relates to an engine housing component and is particularly, although not exclusively, concerned with an engine housing component configured to reduce the number of components stored and managed on a vehicle production line.

Background

[0002] During operation of an engine assembly, small amounts of gases may leak out of the cylinders of the engine into the engine crankcase. Such gases are referred to as blow-by gases. In order to prevent a build-up of blow-by gases within the crankcase, engines typically comprise a crankcase ventilation system, such as a Positive Crankcase Ventilation (PCV) system, configured to extract gases from within the crankcase. The PCV system utilises a low pressure created in the intake system of the engine assembly to draw the blow-by gases out of the crankcase. The extracted gases may be re-introduced into the inlet of the engine assembly.

[0003] The blow-by gases may contain oil, e.g. oil mist. It may be undesirable for the oil to be reintroduced to the inlet of the engine assembly. Hence, the PCV system may comprise an oil separator configured to separate the oil from the gases. The separated oil may be returned to an oil sump of the engine assembly.

[0004] The blow-by gases are typically extracted from the crankcase at a cylinder head of the engine assembly and the oil separator may be mounted on or close to the cylinder head. The oil that has been separated from the blow-by gases by the oil separator may drain back through an oil drain passage formed in one or more housings of the engine assembly to an oil sump.

[0005] For some configurations of engine assembly, such as a naturally aspirated engine assembly, the PCV system may comprise a single oil separator and the separated oil may drain back to the sump via a single oil drain passage formed within housings of the engine assembly. For other configurations of engine assembly, such as a turbocharged engine assembly, the PCV system may comprise two oil separators and two oil drain channels may be formed within the housings to allow the oil from each of the oil separators to drain back to the oil sump of the engine assembly.

[0006] Document EP0599095 discloses a device for ventilating the crankcase of an internal combustion engine.

Statements of Invention

[0007] According to an aspect of the present disclosure, there is provided an engine housing component, the housing component defining two or more drain channels configured to receive oil separated from a crankcase

ventilation system and to drain said oil through the housing component, wherein the engine housing component comprises two or more drain features, each of the drain features corresponding to one of the drain channels, wherein each of the drain features is configured to allow an oil drain pipe to be coupled to the drain feature such that the oil drain pipe is in fluid communication with the corresponding drain channel, wherein a first drain feature differs from the or each of the other drain features, such that a particular oil drain pipe configured to couple to the first drain feature is not couplable to the other drain features.

[0008] Each of the drain features may comprise: a drain port in fluid communication with the corresponding drain channel; and a coupling separate from the drain port, wherein the coupling is configured to allow the oil drain pipe to be coupled to the drain feature.

[0009] The configuration, e.g. the size and/or shape, of the drain port of the first drain feature may be different from the configuration of the drain port of the other drain features. Additionally or alternatively, the configuration, e.g. the size and/or shape, of the coupling of the first drain feature may be different from the configuration of the coupling of the other drain features. Additionally or alternatively again, the relative positions of the drain port and coupling of the first drain feature may be different from the relative positions of the drain ports and couplings of each of the other drain features. For example, a distance, e.g. a centre distance, between the coupling and drain port of the first drain feature may differ from the distance between the couplings and drain ports of the other drain features.

[0010] The coupling may comprise a bore configured to receive a fastener provided on the drain tube. The bore may comprise a threaded portion and the drain tube fastener may be threaded into the bore.

[0011] According to another aspect of the present disclosure, there is provided a housing for an engine assembly, the housing configured to define two or more drain channels configured to permit oil separated from a crankcase ventilation system to drain through the housing, wherein the housing comprises two or more drain features, each of the drain features corresponding to one of the drain channels, wherein the drain features are configured to allow an oil drain pipe to be coupled to the drain feature and arranged in fluid communication with the corresponding drain channel such that the separated oil within the corresponding drain channel can drain through the oil drain pipe to an oil sump of the engine assembly, wherein a first drain feature differs from the others of the drain features, such that a particular oil drain pipe configured to couple to the first drain feature is not couplable to the other drain features.

[0012] An engine housing assembly may comprise the above-mentioned engine housing component and a first oil drain pipe coupled to the first drain feature. The first oil drain pipe may not be couplable to the or each of the other drain features.

[0013] The first oil drain pipe may comprise a fastener configured to couple the first oil drain pipe to the first drain feature. The fastener may be captive on the first oil drain pipe prior to assembly. The first oil drain pipe may further comprise a pipe portion, configured to receive separated oil from the drain channel corresponding to the first drain feature. The first oil drain pipe may be configured such that the pipe portion is in fluid communication with the corresponding drain channel, e.g. via the corresponding drain port, when the fastener is coupled to the first drain feature.

[0014] The first oil drain pipe may have a first end and a second end. The first oil drain pipe may further comprise a tubular body extending between the first and second ends. The first end may be coupled to the first oil drain feature. The first oil drain pipe, e.g. the tubular body, may be configured such that the second end of the first oil drain pipe is positioned within an oil sump at or adjacent to the deepest, e.g. lowest, point of the oil sump. The second end of the first oil drain pipe may be positioned such that it may be below the surface of oil within the oil sump at substantially all engine running conditions. The oil sump may be at least partially defined by the housing, e.g. the housing may define a wall or lid of the oil sump.

[0015] The assembly may further comprise a second oil drain pipe coupled to a second oil drain feature of the engine housing component. The second oil drain pipe may not be couplable to the first oil drain feature.

[0016] The second oil drain pipe may comprise a fastener configured to couple the second oil drain pipe to the second drain feature. The second oil drain pipe may further comprise a pipe portion configured to receive separated oil from the oil channel corresponding to the second drain feature. The second oil drain pipe may be configured such that the pipe portion is in fluid communication with the corresponding drain channel when the fastener is coupled to the second drain feature.

[0017] A distance between the fastener and the pipe portion of the first oil drain pipe may be different from the distance between the fastener and the pipe portion of the second oil drain pipe.

[0018] The second oil drain pipe may have a first end and a second end. A tubular body of the second oil drain pipe may extend between the first and second ends. The first end may be coupled to the second oil drain feature. The second oil drain pipe, e.g. the tubular body, may be configured such that the second end of the second oil drain pipe is positioned within the oil sump at or adjacent to the deepest, e.g. lowest, point of the oil sump. The second end of the first oil drain pipe may be positioned below the surface of oil within the oil sump at substantially all operating condition of the engine. The second end of the second oil drain pipe may be positioned adjacent to, or may be spaced apart from, the second end of the first oil drain pipe.

[0019] According to another aspect of the present disclosure, there is provided a kit of oil drain pipes for coupling to an engine housing component, e.g. the above-

mentioned engine housing component, the oil pipes being configured to couple to an oil drain feature of the housing component to allow oil separated from a crankcase ventilation system to drain through a drain channel defined in the housing into the oil drain pipe, wherein each of the oil drain pipes has a first end comprising a fastening portion, configured to couple the oil drain pipe to the oil drain feature, and a tubular portion, configured to receive the separated oil from the drain channel, wherein the configurations, e.g. the size and/or shape, of the first end of a first oil drain pipe is different from the configuration of the first end of the other oil drain pipes in the kit.

[0020] In other words, a first oil drain pipe in the kit may be couplable to a first oil drain feature of the housing and the other oil drain pipes in the kit may not be couplable to the first oil drain feature.

[0021] The size and/or shape of the first end of the first oil drain pipe may differ in that the relative positions of the fastening portion and tubular portion of the first oil pipe may be different from the other oil drain pipes in the kit. For example, a distance, e.g. a centre distance, between the fastening portion and the tubular portion of the first oil drain pipe may be different from the other oil drain pipes in the kit.

[0022] The fastening portion may comprise a fastener provided on the oil drain pipe. The fastener may be captive on the oil drain pipe prior to the oil drain pipe being coupled to the oil drain feature.

[0023] The fastener may be provided on a boss. The boss may be formed integrally with the pipe portion of the oil drain pipe. A length of the boss may vary between the different oil drain pipes in the kit, e.g. such that the relative positions of the fastening portion and the pipe portion is varied.

[0024] To avoid unnecessary duplication of effort and repetition of text in the specification, certain features are described in relation to only one or several aspects or embodiments of the invention. However, it is to be understood that, where it is technically possible, features described in relation to any aspect or embodiment of the invention may also be used with any other aspect or embodiment of the invention.

Brief Description of the Drawings

[0025] For a better understanding of the present disclosure, and to show more clearly how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 is a sectional view of an engine assembly according to a first arrangement of the present disclosure;

Figure 2 is a schematic view of an engine assembly according to the first arrangement of the present disclosure;

Figures 3a, 3b and 3c, collectively referred to as Figure 3, are top, side and perspective views of a first oil drain pipe according to arrangements of the present disclosure;

Figure 4 is a sectional view of an engine assembly according to a second arrangement of the present disclosure;

Figure 5 is a schematic view of an engine assembly according to the second arrangement of the present disclosure;

Figures 6a, 6b and 6c, collectively referred to as Figure 6, are top, side and perspective views of a second oil drain pipe according to arrangements of the present disclosure;

Figure 7 is a bottom view of a ladder frame according to arrangements of the present disclosure; and

Figure 8 shows a kit of oil drain pipes according to arrangements of the present disclosure.

Detailed Description

[0026] With reference to Figure 1, an engine assembly 2 for a vehicle, such as a motor vehicle, comprises a plurality of engine housings, such as a cylinder head 4, a cylinder block 6, a ladder frame 8 and a sump pan 10.

[0027] The cylinder block 6 defines one or more cylinders 12 of the engine assembly 2. Combustion of fuel and air within the cylinders produces expanding gases which act upon pistons (not shown) within the cylinders to drive a crank shaft 14 of the engine assembly. After the pistons have been displaced by the expanded combustion gases, the combustion gases are exhausted from the cylinders 12.

[0028] The cylinder head 4 defines a plurality of inlet and exhaust valves (not shown) configured to control the flow of inlet air and exhaust gases into and out of the cylinders 12 respectively.

[0029] The sump pan 10 defines an oil sump 18 of the engine assembly 2 within which oil for the engine is stored prior to being pumped around the engine assembly 2 to lubricate components of the engine assembly 2. Oil which has been pumped to a component of the engine assembly 2 drains back through the engine assembly to return to the oil sump 18.

[0030] The ladder frame 8 may be a structural component of the engine assembly configured to provide surfaces for the crank shaft and/or a balance shaft of the engine assembly to be mounted. The ladder frame 8 may comprise one or more stiffening features such as webs and/or ribs.

[0031] The crank shaft 14 is disposed within a crankcase cavity 16 of the engine assembly. As depicted in Figure 1, the crankcase cavity 16 may be defined by the

cylinder block 6 and the ladder frame 8. During operation of the engine assembly 2, gases produced during combustion within the cylinders may leak past the pistons into the crankcase cavity 16. These gases are known as "blow-by" gases.

[0032] Leaking of blow-by gases into the crankcase cavity 16 may increase pressure within the cavity. Additionally, it may be undesirable for the combustion products present within the blow-by gases to build up within the crankcase cavity 16.

[0033] In order to maintain a desirable pressure within the crankcase cavity 16 and/or to prevent the build-up of blow-by gases within the crankcase cavity, the engine assembly 2 may comprise a crankcase ventilation system 20, configured to draw gases out of the crankcase cavity.

[0034] With reference to Figure 2, the PCV system 20 may comprise a PCV valve 22 and a breather tube 24. The PCV valve 22 may be arranged in fluid communication with the crankcase cavity 16 (depicted in Figure 1) and configured to control the flow of gases out of the crankcase cavity. A first end 24a of the breather tube 24 may be coupled to the PCV valve 22 and a second end 24b of the breather tube may be arranged in fluid communication with inlet air within an intake system 30 of the engine assembly. In this way, gases drawn out of the crankcase cavity 16 by the PCV system 20 may be vented into the intake system 30.

[0035] The intake system 30 may comprise an intake duct 32 configured to carry inlet air from an air inlet 34 to an inlet manifold 36. Air may be drawn from the inlet manifold 36 into the cylinders 12 of the engine assembly 2. The intake system 30 further comprises an inlet throttle 38 provided on the intake duct 32 and configured to control the flow of inlet air within the intake duct 32. Due to the presence of the inlet throttle 38 and the operation of engine assembly, a pressure of the inlet air downstream of the inlet throttle 38, e.g. within the inlet manifold 36, may be less than a pressure of inlet air at the air inlet 34. In other words, a vacuum may be generated within the intake system 30 downstream of the inlet throttle 38.

[0036] As depicted in Figure 2, the breather tube 24 of the PCV system may be in fluid communication with the intake system 30 at a position on the intake duct 32 downstream of the inlet throttle 38. The vacuum pressure within the intake system 30 may thereby be utilised by the PCV system 20 to draw gases out of the crankcase via the PCV valve 22.

[0037] The gases extracted from the crankcase cavity 16 may comprise oil, e.g. oil mist, suspended within the gases. It may be undesirable for the oil to be vented into the intake system 30. Oil that is vented into the intake system may be combusted within the cylinders 12 of the engine assembly, which may reduce the amount of oil available to lubricate the engine, as well as increasing emissions from the engine assembly 2. In order to limit oil from being vented into the intake system, the PCV

system 20 may comprise an oil separator 26. The oil separator may be operatively provided on the breather tube 24 between the PCV valve 22 and the intake system 30. The oil separator 26 may be configured to separate the oil from the extracted gases and return the oil to the oil sump 18 (depicted in Figure 1) of the engine, as described below.

[0038] Returning to Figure 1, the oil separator 26 may be mounted on or close to the cylinder head 4 of the engine assembly 2. An oil drain passage 28 may be defined within the engine assembly 2 to allow separated oil from the oil separator 26 to drain back towards the oil sump 18. For example, as depicted in Figure 1, the cylinder head 4, cylinder block 6 and the ladder frame 8 may each define respective oil drain channels 4a, 6a, 8a that form the oil drain passage 28. The oil drain channels formed in each of the engine housing components may be aligned with one another to allow the separated oil to drain through each of the engine housings to the oil sump 18.

[0039] In order to allow separated oil to drain through the engine assembly 2 and return to the oil sump effectively, it may be desirable for an outlet of the oil drain passage 28 to be arranged in the oil sump 18 below the minimum level of oil within the oil sump 18. As depicted in Figure 1, the ladder frame 8 may define an upper interior wall of the oil sump 18. Hence, in order to provide an outlet of the oil drain passage below the level of oil within the oil sump 18, the engine assembly 2 may further comprise an oil drain tube 40. The oil drain tube may extend from the oil drain channel 8a defined in the ladder frame 8 into the oil sump 18 and may provide an outlet for the separated oil below the surface of the oil within the oil sump 18.

[0040] With reference to Figure 3, the oil drain tube 40 has a first end 40a and a second end 40b. A tubular body 40c of the oil drain tube may extend between the first and second ends 40a, 40b. The tubular body 40c may be configured to allow oil to drain through the oil drain tube 40 from the first end 40a to the second end 40b. The tubular body 40c may be a substantially cylindrical tube. Alternatively, the tubular body 40c may be a tube of any other desired cross section.

[0041] The first end 40a of the oil drain tube 40 may comprise a fastening portion 42 and a tubular portion 44. The tubular portion 44 may be in fluid communication with the flow passage of the tubular body 40c. The fastening portion 42 may be configured to couple the oil drain tube 40 to the ladder frame 8, such that the tubular portion 44 is in fluid communication with the oil drain channel 8a defined in the ladder frame.

[0042] The second end 40b of the oil drain tube may define an outlet 46 of the oil drain tube. The tubular portion 44 may be in fluid communication with the outlet 46 via the tubular body 40c. As depicted in Figure 1, when the first end 40a of the oil drain tube 40 is coupled to the ladder frame 8, the tubular body 40c may protrude into the oil sump 18. The oil drain tube 40 may be configured

such that the outlet 46 is positioned at or adjacent to the deepest, e.g. lowest, point of the oil sump 18. The outlet 46 may thereby be arranged below the level of oil within the oil sump 18 at substantially all operating conditions of the engine assembly 2.

[0043] In the arrangement disclosed in Figures 1 and 2, the engine assembly 2 is a naturally aspirated engine assembly. At substantially all operating conditions of the engine assembly 2, a low pressure is generated in the intake system 30 downstream of the throttle 38. Hence, the PCV system 20 may operate at substantially all operating conditions of the engine assembly to extract blow-by gases from the crankcase cavity 16.

[0044] With reference to Figure 4 and 5, an engine assembly 102 according to another arrangement of the present disclosure will now be described. The engine assembly 102 is similar to the engine assembly 2 and comprises a cylinder head 104, a cylinder block 106, a ladder frame 108 and a sump pan 110 configured in the same way as the engine housing components described with reference to Figures 1 and 2 and the features described in relation to the engine assembly 2 may equally apply to the engine assembly 102. However, the engine assembly 102 differs from the engine assembly 2 due to the inclusion of a turbocharger 150 within the engine assembly 102.

[0045] The turbocharger 150 comprises a turbocharger compressor 152 provided within an intake system 130 of the engine assembly 102. The turbocharger compressor 152 is configured to selectively increase the pressure of inlet gases within the intake system 130. The turbocharger compressor 152 is driven by a turbocharger turbine 154 provided on the same shaft as the turbocharger compressor and arranged within the flow of exhaust gases leaving the engine cylinders. In the arrangement depicted in Figure 5, the intake system 130 does not comprise an intake throttle, however, in some arrangements an intake throttle may be provided, e.g. upstream of the turbocharger compressor 152.

[0046] The engine assembly 102 further comprises a PCV system 120 configured to extract blow-by gases from a crankcase cavity 116 of the engine assembly 102. The PCV system 120 may comprise a PCV valve 122, a breather tube 124 and an oil separator 126 configured in the same way as the PCV valve 22, the breather tube 24 and the oil separator 26 depicted in Figure 2. When the turbocharger compressor 152 is operating, the pressure of inlet air within an inlet manifold 136 may be high. The pressure within the inlet manifold may be greater than the pressure within the crankcase cavity 116. Hence, the PCV system 120 may not be capable of venting the blow-by gases from the crankcase into the inlet system 130 through the breather tube 124.

[0047] As shown in Figure 5, in order to allow the PCV system 120 to operate when the turbocharger compressor 152 is operating, the PCV system 120 may comprise a further PCV valve 123, a further breather tube 125 and a further oil separator 127. The further PCV valve 123,

further breather tube 125 and the further oil separator 127 may be configured in a similar manner to the PCV valve 122, the breather tube 124 and the oil separator 126, except that the further breather tube 125 may be in fluid communication with the inlet system 130 at a position upstream of the turbocharger compressor 152. If the intake system 130 comprises an inlet throttle, the breather tube 124 may be arranged in fluid communication with the intake system at a position downstream of the inlet throttle.

[0048] When the turbocharger compressor 152 is not operating, the PCV system 120 may vent the crankcase cavity 116 via the breather tube 124 and/or 125 and when the turbocharger compressor is operating, the PCV system may vent the crankcase cavity 116 via the breather tube 125.

[0049] As depicted in Figure 4, the further oil separator 127 may be mounted on or close to the cylinder head 106. The further oil separator 127 may be mounted adjacent to the oil separator 126 or may be mounted away from the oil separator 126. The engine assembly 102 may define an oil drain passage 128 configured to allow the oil separated by the oil separator 126 to drain back to an oil sump 118 of the engine assembly. The cylinder head 104, cylinder block 106 and ladder frame 108 may each define respective, commonly aligned oil drain channels 104a, 106a, 108a that form the oil drain passage 128.

[0050] The oil separated by the further oil separator 127 may drain back to the oil sump together with the oil from the oil separator 126, e.g. via the oil drain passage 128. Alternatively, the engine assembly 102 may define a further oil drain passage 129 configured to allow the oil separated by the further oil separator 127 to drain back to the oil sump 118 separately. The cylinder head, cylinder block and ladder frame may define further oil drain channels 104b, 106b, 108b respectively. As depicted in Figure 4, the further oil drain channels 104b, 106b, 108b may be aligned with each other to form the further oil drain passage 129.

[0051] As described above, it may be desirable for outlets of the oil drain passage 128 and the further oil drain passage 129 to be arranged in the oil sump 118 below the level of oil within the sump. The engine assembly 102, may comprise the oil drain tube 40 described above, the oil drain tube may be coupled to the ladder frame 108, such that the tubular portion 44 is in fluid communication within the oil drain channel 108a. The engine assembly 102 may comprise a further oil drain tube 140 coupled to the ladder frame 108.

[0052] With reference to Figure 6, the further oil drain tube 140 may be similar to the oil drain tube 40 described above, and may have a first end 140a, a second end 140b and a tubular body 140c. The first end 140a may comprise a fastening portion 142 and a tubular portion 144. As depicted in Figure 4, the further oil drain tube may be coupled to the ladder frame 108, e.g. at the fastening portion 142, and the tubular portion 144 of the

further oil drain tube may be arranged in fluid communication with the further oil drain channel 108b.

[0053] With reference to Figure 7, the ladder frame 108 may comprise an oil drain feature 109 and a further oil drain feature 111. The oil drain features 109, 111 may be provided on and/or between the stiffening features of the ladder frame 108. The oil drain feature 109 may correspond to the oil drain channel 108a and the further oil drain feature may correspond to the further oil drain channel 108b. The oil drain features 109, 111 may each comprise a coupling portion 109a, 111a and a drain port 109b, 111b. The coupling portions 109a, 111a may be configured to permit the oil drain tubes 40, 140 to be coupled to the ladder frame 108 at the oil drain features 109, 111. For example, the coupling portions 109a, 111a may comprise a bore configured to receive a fastener provided on the oil drain tube. The bore may comprise a threaded portion.

[0054] The drain ports 109b, 111b of the oil drain feature and further oil drain feature may define outlets of the oil drain channel 108a and further oil drain channel 108b respectively. The drain ports 109b, 111b may be configured to couple to the tubular portions 44, 144 of the oil drain tube and further oil drain tube, such that the oil drain tubes are arranged in fluid communication with the oil drain channel 108a and further oil drain channel 108b respectively.

[0055] In some arrangements, the tubular portions 44, 144 may be partially received within the drain ports 109b, 110b. As depicted in Figures 3 and 6, the tubular portions 44, 144 may comprise seals 44a, 144a, such as O-ring seals, configured to create a seal between the tubular portion and the drain ports. When the tubular portion 44, 144 is received within the drain port 109b, 111b, the seals 44a, 144a may be arranged between outer surfaces of the tubular portions 44, 144 and inner surfaces of the respective drain ports 109b, 111b. It is also envisaged that the opposite arrangement may apply, e.g. with the drain ports received within the tubular portions 44, 144.

[0056] The configuration, e.g. the size and/or shape, of the coupling portions 109a, 111a of the oil drain features 109, 111 may correspond to the size and/or shape of the fastening portions 42, 142 of the oil drain tubes 40, 140 respectively. Similarly, the configuration, e.g. the size and/or shape, of the drain ports 109b, 111b of the oil drain features 109, 111 may correspond to the size and/or shape of the tubular portions 44, 144 of the oil drain tubes 40, 140 respectively.

[0057] Furthermore, the relative positions of the coupling portion 109a and drain port 109b, may correspond to the relative positions of the fastening portion 42 and tubular portion 44 the oil drain tube 40 and the relative positions of the coupling portion 111a and drain port 111b may correspond to the relative positions of the fastening portion 142 and tubular portion 144 of the further oil drain tube 140. In other words, the configuration of the oil drain features 109, 111 may correspond to the configuration of the first ends of the oil drain tubes 40, 140. In this way,

when the fastening portions 42, 142 of the oil drain tubes are coupled to the coupling portions 109a, 111a, the tubular portions 44, 144 may be in fluid communication with the oil drain channel 108a and further oil drain channel 108b respectively.

[0058] The configuration, e.g. the size, shape and/or relative positions of the coupling portion 109a, 111a and drain port 109b, 111b, of the oil drain features 109 111 may differ. For example, as depicted in Figure 7, a distance, e.g. a centre distance h_{d1} , h_{d2} , between the coupling portion 109a and the drain port 109b of the oil drain feature 109 may be different to the distance between the coupling portion 111a and the drain port 111b of the further drain feature 111.

[0059] In the arrangement shown in Figure 7, the size and shape of the coupling portions 109a, 111a and drain ports 109b, 111b are the same. However, in other arrangements, the size and shape of the coupling portions 109a, 111a and/or drain ports 109b, 111b may differ. For example, the drain port of one of the oil drain features may be circular and the drain port of the other oil drain features may be square or any other shape. Alternatively, the drain ports may each be circular and the diameters of the drain ports may vary. The spacing between the coupling portion and the drain port of a particular drain feature may or may not differ from that of another drain features.

[0060] As mentioned above the configuration of the first end of oil drain tube 40, 140 may correspond to the configuration of the oil drain feature 109, 111 to which the oil drain tube couples. Hence, when the configuration of the oil drain feature 109 is different to the configuration of the further oil drain feature 111, the configurations of the first ends of the oil drain tube 40 and further oil drain tube 140 may differ accordingly. For example, as depicted in Figures 3a and 6a, distances t_{d1} , t_{d2} between the centres of the fastening portions 42, 142 and tubular portions 44, 144 of the oil drain tubes may be different. Hence, the oil drain tube 40 may be couplable to the oil drain feature 109 but may not be couplable to the further oil drain feature 111. Similarly, the further oil drain tube 140 may be couplable to the further oil drain feature 111, but may not be couplable to the oil drain feature 109.

[0061] Providing differently configured oil drain features and oil drain tubes within the engine assembly 102 may be beneficial, as it may allow the ladder frame 108 comprising the oil drain feature 109 and the further oil drain feature 111 to be provided on both the naturally aspirated engine assembly 2 and the turbocharged engine assembly 102, whilst ensuring that the oil drain tube 40 is correctly assembled within the engine assembly.

[0062] As described above, the PCV system 20 provided on the naturally aspirated engine assembly 2 may comprise a single oil separator 26. Hence, the engine assembly 2 may comprise a single oil drain passage 28 and a single oil drain tube 40. When the ladder frame 108, which comprises the oil drain feature 109 and the further oil drain feature 111, is provided within the engine

assembly 2, it is desirable for the oil drain tube 40 to be coupled to the correct oil drain feature, e.g. the oil drain feature corresponding to the oil drain passage 28, in order for the separated oil to drain effectively from the oil separator 26 to the oil sump 18.

[0063] If the oil drain feature 109 were configured similarly to the further oil drain feature 111, it may be possible for the oil drain tube 40 to be incorrectly coupled to the further oil drain feature 111. However, when the configuration of the further oil drain feature 111 differs from the configuration of the oil drain feature 109, the oil drain tube 40 may not be couplable to the further oil drain feature 111. This may prevent incorrect assembly of the engine assembly 2.

[0064] When the ladder frame 108 is provided within the turbocharged engine assembly 102, the oil drain tube 40 and the further oil drain tube 140 may both be provided within the engine assembly and may be coupled to the oil drain feature 109 and further oil drain feature 111 respectively. The ladder frame 108 may therefore be common to both the engine assembly 2 and the turbocharger engine assembly 102. Hence, the ladder frames 8, 108 may be identical and it may not be necessary for two different ladder frames to be produced, or stored and managed on the production line for the engine assemblies 2, 102. Providing two different designs of oil drain tube 40, 140 may be cheaper and easier to manage than two differently design ladder frames.

[0065] Providing dissimilar oil drain features 109, 111 and dissimilar oil drain tube 40, 140 within the engine assembly 102 may be further advantageous, as it may allow the tube bodies 40c, 140c of the oil drain tubes to be different. For example, the tube bodies may have different lengths and may extend at different angles relative to the first ends 40a, 140a of the oil drain tubes. For example, as depicted in Figures 3a and 6a, an angle α_1 , α_2 of the tubular body may be defined as the angle between a line between the centres of the fastening portion 42, 142 and the tubular portion 44, 144, and a centre line of the tubular body 40c, 140c.

[0066] Providing oil drain tubes with tube bodies 40c, 140c that are arranged at different angles relative to the first ends 40a, 140a of the drain tubes provides greater flexibility in the design of the oil drain features 109, 110 of the ladder frame 108. In particular, the orientations of the oil drain features may be separately adjusted, as desired, and the angle of the corresponding tubular body adjusted accordingly, such that the relative positions of the outlets 46, 146 within the oil sump are not affected.

[0067] With reference to Figure 8, when assembling the engine assembly 102 or another engine assembly, a kit 800 of oil drain tubes may be provided to be coupled to a ladder frame of the engine assembly, such as the ladder frame 108. The kit 800 may comprise a plurality of oil drain tubes. Each of the oil drain tubes may have a first end comprising a fastening portion and a tubular portion, a second end and a tubular body. The configuration, e.g. the size and/or shape, of the first end of a first oil

drain pipe in the set may be different from the size and/or shape of the first ends of the or each of the other oil drain pipes in the set. In some arrangements, the configuration of the first ends may vary such that the relative positions of the fastening portion and the tubular portion of the first oil drain tube is different to the relative positions of the fastening portion and tubular portion of the or each of the other oil drain pipes in the kit. For example, as depicted in Figure 8, the kit 800 may comprise the oil drain tube 40 and the oil drain tube 140.

[0068] The kit 800 may therefore be configured such that the first oil drain tube is couplable to one of the oil drain features provided on the ladder frame but is not couplable to the other oil drain features provided on the ladder frame. In some arrangements, each of the oil drain tubes in the kit 800 may be couplable to a different oil drain feature provided on the ladder frame.

[0069] Returning to Figures 3 and 6, the fastening portions 42, 142 of the oil drain tubes may comprise a fastener 42a, 142a, e.g. a bolt or screw, coupled to the first end of the oil drain tube. The fastener may be captive on the first end of the oil drain tube. In other words, the fastener may be permitted to rotate relative to the first end of the drain tube, e.g. to allow the fastener to be threaded into the bore formed on the ladder frame 8, 108, however, the fastener may be prevented from decoupling from the oil drain tube 40, 140 prior to assembly of the engine assembly 2, 102.

[0070] Providing a fastener that is captive on the first end of the oil drain tube may allow a technician to quickly determine whether the configuration, e.g. the size, shape and/or relative positions of the fastening portion 42 and the tubular portion of the oil drain tube corresponds to the configuration of an oil drain features of the ladder frame when assembling the engine assembly 2, 102.

[0071] The fastener 42a, 142a may be coupled to a boss 42b, 142b formed at the first end of the oil drain pipe. The boss 42b, 142b may extend from the tubular portion 44, 144 to the position of the fastener 42a, 142a. The boss 42b 142b may comprise one or more stiffening features, such as webs or ribs, configured to increase the stiffness of the boss and reduce deflections of the tubular portion 44, 144 relative to the fastening portion 42, 142.

[0072] Although in the arrangements depicted in Figures 1, 2 and 4, 5 the engine assemblies depicted comprise one oil drain channel and two oil drain channels respectively, it is also envisaged that, in other arrangement of the disclosure, the engine assembly may comprise more than two oil drain channels and a corresponding number of oil drain features provided on the ladder frame of the engine assembly. In this case, the engine assembly may comprise a corresponding number of oil drain tubes configured to couple to the oil drain features. When the engine assembly comprises more than two oil drain tubes, the first end of each of the drain tubes may be differently configured, such that each of the oil drain tubes is couplable to one of the oil drain features but is

not couplable to the other oil drain features. Alternatively, the first end of two or more than one of the oil drain pipes may be similar, and the first ends of one or more of the oil drain pipes may be configured differently to one or more of the other oil drain pipes.

Claims

1. An engine housing component (108), the housing component defining two or more drain channels (108a, 108b) configured to receive oil separated from a crankcase ventilation system (120) and to drain said oil through the housing component, wherein the engine housing component comprises two or more drain features (109, 111), each of the drain features corresponding to one of the drain channels, wherein each of the drain features is configured to allow an oil drain pipe (40, 140) to be coupled to the drain feature such that the oil drain pipe is in fluid communication with the corresponding drain channel, **characterised in that** a first drain feature differs from the or each of the other drain features, such that a particular oil drain pipe configured to couple to the first drain feature is not couplable to the other drain features.
2. The engine housing component (108) of claim 1, wherein each of the drain features (109, 111) comprise:
 - a drain port (109b, 111b) in fluid communication with the corresponding drain channel (108a, 108b); and
 - a coupling (109a, 111a) separate from the drain port, wherein the coupling is configured to allow the oil drain pipe (40, 140) to be coupled to the drain feature.
3. The engine housing component (108) of claim 2, wherein the size and/or shape of the drain port (109b) of the first drain feature (109) is different from the size and/or shape of the drain port (111b) of the other drain features (111).
4. The engine housing component (108) of claim 2 or 3, wherein the size and/or shape of the coupling (109a) of the first drain feature (109) is different from the size and/or shape of the coupling (111a) of the other drain features (111).
5. The engine housing component (108) of any of claims 2 to 4, wherein the relative positions of the drain port (109b) and coupling (109a) of the first drain feature (109) is different from the relative positions of the drain ports (111b) and couplings (111b) of each of the other drain features (111).

6. An engine housing assembly (102) comprising an engine housing component (108) according to any of the preceding claims and a first oil drain pipe (40) coupled to the first drain feature (109), wherein the first oil drain pipe is not couplable to the or each of the other drain features (111). 5
7. The engine housing assembly (102) of claim 6, wherein the first oil drain pipe (40) comprises a fastener (42a) configured to couple the first oil drain pipe to the first drain feature (109), and a pipe portion (44), configured to receive separated oil from the drain channel (108a) corresponding to the first drain feature, wherein the first oil drain pipe is configured such that the pipe portion is in fluid communication with the corresponding drain channel when the fastener is coupled to the first drain feature. 10
8. The engine housing assembly (102) of claim 7, wherein the fastener (42a) is captive on the first oil drain pipe (40) prior to assembly. 15
9. The engine housing assembly (102) of any of claims 6 to 8, wherein the first oil drain pipe (40) has a first end (40a) and a second end (40b), wherein the first end is coupled to the first oil drain feature (109) and wherein the first oil drain pipe is configured such that the second end of the first oil drain pipe is positioned within an oil sump (118) at or adjacent to the lowest point of the oil sump. 20
10. The engine housing assembly (102) of any of claims 6 to 9, wherein the assembly further comprises a second oil drain pipe (140) coupled to a second oil drain feature (111) of the engine housing component (108), wherein the second oil drain pipe is not couplable to the first oil drain feature (109). 25
11. The engine housing assembly (102) of claim 10, wherein the second oil drain pipe (140) comprises a fastener (142a) configured to couple the second oil drain pipe to the second drain feature (111), and a pipe portion (144) configured to receive separated oil from the oil channel (108b) corresponding to the second drain feature, wherein the second oil drain pipe is configured such that the pipe portion is in fluid communication with the corresponding drain channel when the fastener is coupled to the second drain feature. 30
12. The engine housing assembly (102) of claim 11, wherein a distance between the fastener (42a) and the pipe portion (44) of the first oil drain pipe (40) is different from the distance between the fastener (142a) and the pipe portion (144) of the second oil drain pipe (140). 35
13. A kit (800) of oil drain pipes (40, 140) for coupling to 40

an engine housing component (108), the oil pipes being configured to couple to an oil drain feature (109, 111) of the housing component to allow oil separated from a crankcase ventilation system (120) to drain through a drain channel (108a, 108b) defined in the housing component into the oil drain pipe, wherein each of the oil drain pipes has a first end (40a, 140a) comprising a fastening portion (42, 142), configured to couple the oil drain pipe to the oil drain feature (109, 111), and a pipe portion (44, 144), configured to receive the separated oil from the drain channel, wherein the size and/or shape of the first end of a first oil drain pipe is different from the size and/or shape of the first end of the other oil drain pipes in the kit. 45

14. The kit (800) of claim 13, wherein the relative positions of the fastening portion (42) and pipe portion (44) of the first oil pipe (40) are different from the other oil drain pipes (140) in the kit. 50

15. The kit (800) of claim 13 or 14, wherein the fastening portion (42, 142) comprises a fastener (42a, 142a) provided on the oil drain pipe, wherein the fastener is provided on a boss (42b, 142b) formed integrally with the pipe portion (44, 144) of the oil drain pipe (40, 140). 55

30 Patentansprüche

1. Motorgehäusekomponente (108), wobei die Gehäusekomponente zwei oder mehrere Ablasskanäle (108a, 108b) definiert, die konfiguriert sind, um Öl aufzunehmen, das von einem Kurbelgehäuseentlüftungssystem (120) abgeschieden wird und das Öl durch die Gehäusekomponente abzulassen, wobei die Motorgehäusekomponente zwei oder mehrere Ablassseinrichtungen (109, 111) umfasst, wobei jede der Ablassseinrichtungen einem der Ablasskanäle entspricht, wobei jede der Ablassseinrichtungen konfiguriert ist, um zu ermöglichen, dass ein Ölablassrohr (40, 140) so mit der Ablassseinrichtung gekoppelt wird, dass das Ölablassrohr in Fluidverbindung mit dem entsprechenden Ablasskanal ist, **dadurch gekennzeichnet, dass** sich eine erste Ablassseinrichtung von der oder jeder der anderen Ablassseinrichtungen unterscheidet, sodass ein jeweiliges Ölablassrohr, das konfiguriert ist, um mit der ersten Ablassseinrichtung gekoppelt zu werden, nicht mit den anderen Ablassseinrichtungen gekoppelt werden kann. 50
2. Motorgehäusekomponente (108) gemäß Anspruch 1, wobei jede der Ablassseinrichtungen (109, 111) Folgendes umfasst: 55

eine Ablassöffnung (109b, 111b) in Fluidverbin-

- dung mit dem entsprechenden Ablasskanal (108a, 108b); und
 eine von der Ablassöffnung getrennte Kupplung (109a, 111a), wobei die Kupplung konfiguriert ist, um zu ermöglichen, dass das Ölablassrohr (40, 140) mit der Ablassvorrichtung gekoppelt wird.
3. Motorgehäusekomponente (108) gemäß Anspruch 2, wobei die Größe und/oder Form der Ablassöffnung (109b) der ersten Ablassseinrichtung (109) sich von der Größe und/oder Form der Ablassöffnung (111b) der anderen Ablassseinrichtungen (111) unterscheidet.
4. Motorgehäusekomponente (108) gemäß Anspruch 2 oder 3, wobei sich die Größe und/oder Form der Kupplung (109a) der ersten Ablassseinrichtung (109) von der Größe und/oder Form der Kupplung (111a) der anderen Ablassseinrichtungen (111) unterscheidet.
5. Motorgehäusekomponente (108) gemäß einem der Ansprüche 2 bis 4, wobei die relativen Positionen der Ablassöffnung (109b) und der Kupplung (109a) der ersten Ablassseinrichtung (109) von den relativen Positionen der Ablassöffnungen (111b) und der Kupplungen (111b) von jeder der anderen Ablassseinrichtungen (111) verschieden sind.
6. Motorgehäuseanordnung (102), umfassend eine Motorgehäusekomponente (108) gemäß einem der vorherigen Ansprüche und ein erstes Ölablassrohr (40), das mit der ersten Ablassseinrichtung (109) gekoppelt ist, wobei das erste Ölablassrohr nicht mit der oder jeder der anderen Ablassseinrichtungen (111) gekoppelt werden kann.
7. Motorgehäuseanordnung (102) gemäß Anspruch 6, wobei das erste Ölablassrohr (40) ein Befestigungsmittel (42a), das konfiguriert ist, um das erste Ölablassrohr mit der ersten Ablassseinrichtung (109) zu koppeln, und einen Rohrabschnitt (44), der konfiguriert ist, um abgeschiedenes Öl aus dem Ablasskanal (108a) aufzunehmen, der der ersten Ablassseinrichtung entspricht, umfasst, wobei das erste Ölablassrohr so konfiguriert ist, dass der Rohrabschnitt in Fluidverbindung mit dem entsprechenden Ablasskanal ist, wenn das Befestigungsmittel mit der ersten Ablassseinrichtung gekoppelt ist.
8. Motorgehäuseanordnung (102) gemäß Anspruch 7, wobei das Befestigungsmittel (42a) vor einem Zusammenbau unverlierbar auf dem ersten Ölablassrohr (40) ist.
9. Motorgehäuseanordnung (102) gemäß einem der Ansprüche 6 bis 8, wobei das erste Ölablassrohr (40) ein erstes Ende (40a) und ein zweites Ende (40b) aufweist, wobei das erste Ende mit der ersten Ölablassseinrichtung (109) gekoppelt ist und wobei das erste Ölablassrohr so konfiguriert ist, dass das zweite Ende des ersten Ölablassrohrs innerhalb einer Ölwanne (118) an dem oder in der Nähe des tiefsten Punkts der Ölwanne positioniert ist.
10. Motorgehäuseanordnung (102) gemäß einem der Ansprüche 6 bis 9, wobei die Anordnung ferner ein zweites Ölablassrohr (140) umfasst, das mit einer zweiten Ölablassseinrichtung (111) der Motorgehäusekomponente (108) gekoppelt ist, wobei das zweite Ölablassrohr nicht mit der ersten Ölablassseinrichtung (109) gekoppelt werden kann.
11. Motorgehäuseanordnung (102) gemäß Anspruch 10, wobei das zweite Ölablassrohr (140) ein Befestigungsmittel (142a), das konfiguriert ist, um das zweite Ölablassrohr mit der zweiten Ablassseinrichtung (111) zu koppeln, und einen Rohrabschnitt (144), der konfiguriert ist, um abgeschiedenes Öl aus dem Ablasskanal (108b) aufzunehmen, der der zweiten Ablassseinrichtung entspricht, umfasst, wobei das zweite Ölablassrohr so konfiguriert ist, dass der Rohrabschnitt in Fluidverbindung mit dem entsprechenden Ablasskanal ist, wenn das Befestigungsmittel mit der zweiten Ablassseinrichtung gekoppelt ist.
12. Motorgehäuseanordnung (102) gemäß Anspruch 11, wobei sich ein Abstand zwischen dem Befestigungsmittel (42a) und dem Rohrabschnitt (44) des ersten Ölablassrohrs (40) von dem Abstand zwischen dem Befestigungsmittel (142a) und dem Rohrabschnitt (144) des zweiten Ölablassrohrs (140) unterscheidet.
13. Kit (800) von Ölablassrohren (40, 140) zum Koppeln mit einer Motorgehäusekomponente (108), wobei die Ölröhre konfiguriert sind, um mit einer Ölablassseinrichtung (109, 111) der Gehäusekomponente gekoppelt zu sein, um zu ermöglichen, dass von einem Kurbelgehäuseentlüftungssystem (120) abgeschiedenes Öl durch einen in der Gehäusekomponente definierten Ablasskanal (108a, 108b) in das Ölablassrohr abläuft, wobei jedes der Ölablassrohre ein erstes Ende (40a, 140a) aufweist, umfassend einen Befestigungsabschnitt (42, 142), der konfiguriert ist, um das Ölablassrohr mit der Ölablassseinrichtung (109, 111) zu koppeln, und einen Rohrabschnitt (44, 144), der konfiguriert ist, um das abgeschiedene Öl aus dem Ablasskanal aufzunehmen, wobei die Größe und/oder Form des ersten Endes eines ersten Ölablassrohrs sich von der Größe und/oder Form des ersten Endes der anderen Ölablassrohre in dem Satz unterscheidet.

14. Kit (800) gemäß Anspruch 13, wobei sich die relativen Positionen des Befestigungsabschnitts (42) und Rohrabchnitts (44) des ersten Ölhohrs (40) von den anderen Ölablassrohren (140) in dem Kit unterscheiden.
15. Kit (800) gemäß Anspruch 13 oder 14, wobei der Befestigungsabschnitt (42, 142) ein Befestigungsmittel (42a, 142a) umfasst, das an dem Ölablassrohr bereitgestellt ist, wobei das Befestigungsmittel an einem Vorsprung (42b, 142b) bereitgestellt ist, der einstückig mit dem Rohrabchnitt (44, 144) des Ölablassrohrs (40, 140) gebildet ist.

Revendications

1. Élément de carter de moteur (108), l'élément de carter définissant deux ou plusieurs canaux de vidange (108a, 108b) conçus pour recevoir l'huile séparée d'un système de ventilation du vilebrequin (120) et pour vidanger ladite huile par l'intermédiaire de l'élément de carter, dans lequel l'élément de carter de moteur comprend deux ou plusieurs dispositifs de vidange (109, 111), chacun des dispositifs de vidange correspondant à l'un des canaux de vidange, dans lequel chacun des dispositifs de vidange est conçu pour permettre à un tuyau de vidange d'huile (40, 140) d'être accouplé au dispositif de vidange de sorte que le tuyau de vidange d'huile soit en communication fluïdique avec le canal de vidange correspondant, **caractérisé en ce qu'un** premier dispositif de vidange diffère du ou de chacun des autres dispositifs de vidange, de sorte qu'un tuyau de vidange d'huile particulier conçu pour s'accoupler au premier dispositif de vidange ne puisse pas être accouplé aux autres dispositifs de vidange.
2. Élément de carter de moteur (108) selon la revendication 1, dans lequel chacun des dispositifs de vidange (109, 111) comprend :
 - un orifice de vidange (109b, 111b) en communication fluïdique avec le canal de vidange correspondant (108a, 108b) ; et
 - un raccordement (109a, 111a) séparé de l'orifice de vidange, dans lequel le raccordement est conçu pour permettre au tuyau de vidange d'huile (40, 140) d'être accouplé au dispositif de vidange.
3. Élément de carter de moteur (108) selon la revendication 2, dans lequel la taille et/ou la forme de l'orifice de vidange (109b) du premier dispositif de vidange (109) sont différentes de la taille et/ou de la forme de l'orifice de vidange (111b) des autres dispositifs de vidange (111).

4. Élément de carter de moteur (108) selon la revendication 2 ou 3, dans lequel la taille et/ou la forme du raccordement (109a) du premier dispositif de vidange (109) sont différentes de la taille et/ou de la forme du raccordement (111a) des autres dispositifs de vidange (111).
5. Élément de carter de moteur (108) selon l'une quelconque des revendications 2 ou 4, dans lequel les positions relatives de l'orifice de vidange (109b) et du raccordement (109a) du premier dispositif de vidange (109) sont différentes des positions relatives des orifices de vidange (111b) et des raccordements (111b) de chacun des autres dispositifs de vidange (111).
6. Ensemble carter de moteur (102) comprenant un élément de carter de moteur (108) selon l'une quelconque des revendications précédentes et un premier tuyau de vidange d'huile (40) accouplé au premier élément de vidange (109), dans lequel le premier tuyau de vidange d'huile ne peut pas être accouplé au ou à chacun des autres dispositifs de vidange (111).
7. Ensemble carter de moteur (102) selon la revendication 6, dans lequel le premier tuyau de vidange d'huile (40) comprend un élément de fixation (42a) conçu pour accoupler le premier tuyau de vidange d'huile au premier élément de vidange (109), et une partie de tuyau (44), conçue pour recevoir l'huile séparée du canal de vidange (108a) correspondant au premier élément de vidange, dans lequel le premier tuyau de vidange d'huile est conçu de sorte que la partie de tuyau est en communication fluïdique avec le canal de vidange correspondant lorsque l'élément de fixation est accouplé au premier élément de vidange.
8. Ensemble carter de moteur (102) selon la revendication 7, dans lequel l'élément de fixation (42a) est captif sur le premier tuyau de vidange d'huile (40) avant l'ensemble.
9. Ensemble carter de moteur (102) selon l'une quelconque des revendications 6 à 8, dans lequel le premier tuyau de vidange d'huile (40) présente une première extrémité (40a) et une seconde extrémité (40b), dans lequel la première extrémité est accouplée au premier élément de vidange d'huile (109) et dans lequel le premier tuyau de vidange d'huile est conçu de sorte que la seconde extrémité du premier tuyau de vidange d'huile est positionnée à l'intérieur d'un puisard d'huile (118) au niveau ou à proximité du point le plus bas du puisard d'huile.
10. Ensemble carter de moteur (102) selon l'une quelconque des revendications 6 à 9, dans lequel l'en-

semble comprend en outre un second tuyau de vidange d'huile (140) accouplé à un second élément de vidange d'huile (111) de l'élément de carter de moteur (108), dans lequel le second tuyau de vidange d'huile ne peut pas être accouplé au premier dispositif de vidange d'huile (109).

5

de fixation (42a, 142a) prévu sur le tuyau de vidange d'huile, dans lequel l'élément de fixation est prévu sur un bossage (42b, 142b) formé d'une seule pièce avec la partie de tuyau (44, 144) du tuyau de vidange d'huile (40, 140).

11. Ensemble carter de moteur (102) selon la revendication 10, dans lequel le second tuyau de vidange d'huile (140) comprend un élément de fixation (142a) conçu pour accoupler le second tuyau de vidange d'huile au second élément de vidange (111) et une partie de tuyau (144) conçue pour recevoir l'huile séparée du canal d'huile (108b) correspondant au second élément de vidange, dans lequel le second tuyau de vidange d'huile est conçu de sorte que la partie de tuyau est en communication fluïdique avec le canal de vidange correspondant lorsque l'élément de fixation est accouplé au second élément de vidange.
12. Ensemble carter de moteur (102) selon la revendication 11, dans lequel une distance entre l'élément de fixation (42a) et la partie de tuyau (44) du premier tuyau de vidange d'huile (40) est différente de la distance entre l'élément de fixation (142a) et la partie de tuyau (144) du second tuyau de vidange d'huile (140).
13. Kit (800) de tuyaux de vidange d'huile (40, 140) destinés au raccordement à un élément de carter de moteur (108), les tuyaux de vidange d'huile étant conçus pour s'accoupler à un dispositif de vidange d'huile (109, 111) de l'élément de carter pour permettre à l'huile séparée d'un système de ventilation de vilebrequin (120) de se vidanger par l'intermédiaire d'un canal de vidange (108a, 108b) défini dans l'élément de carter, dans lequel chacun des tuyaux de vidange d'huile présente une première extrémité (40a, 140a) comprenant une partie de fixation (42, 142), conçue pour accoupler le tuyau de vidange d'huile à la caractéristique de vidange d'huile (109, 111) et une partie de tuyau (44, 144), conçue pour recevoir l'huile séparée du canal de vidange, dans lequel la taille et/ou la forme de la première extrémité d'un premier tuyau de vidange d'huile sont différentes de la taille et/ou de la forme de la première extrémité des autres tuyaux de vidange d'huile dans le kit.
14. Kit (800) selon la revendication 13, dans lequel les positions relatives de la partie de fixation (42) et de la partie de tuyau (44) du premier tuyau d'huile (40) sont différentes des autres tuyaux de vidange d'huile (140) du kit.
15. Kit (800) selon la revendication 13 ou 14, dans lequel la partie de fixation (42, 142) comprend un élément

10

15

20

25

30

35

40

45

50

55

Fig. 1

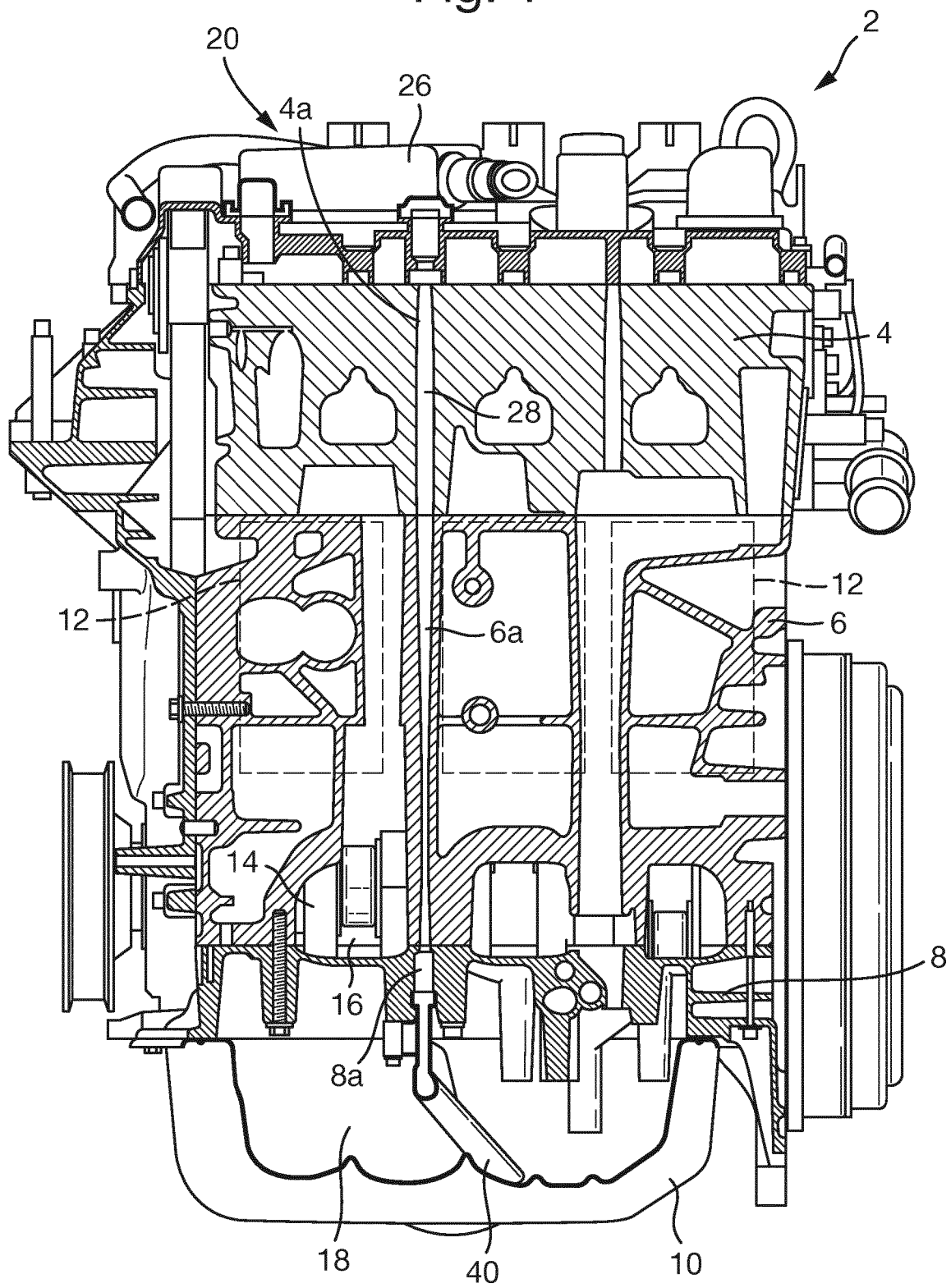


Fig. 2

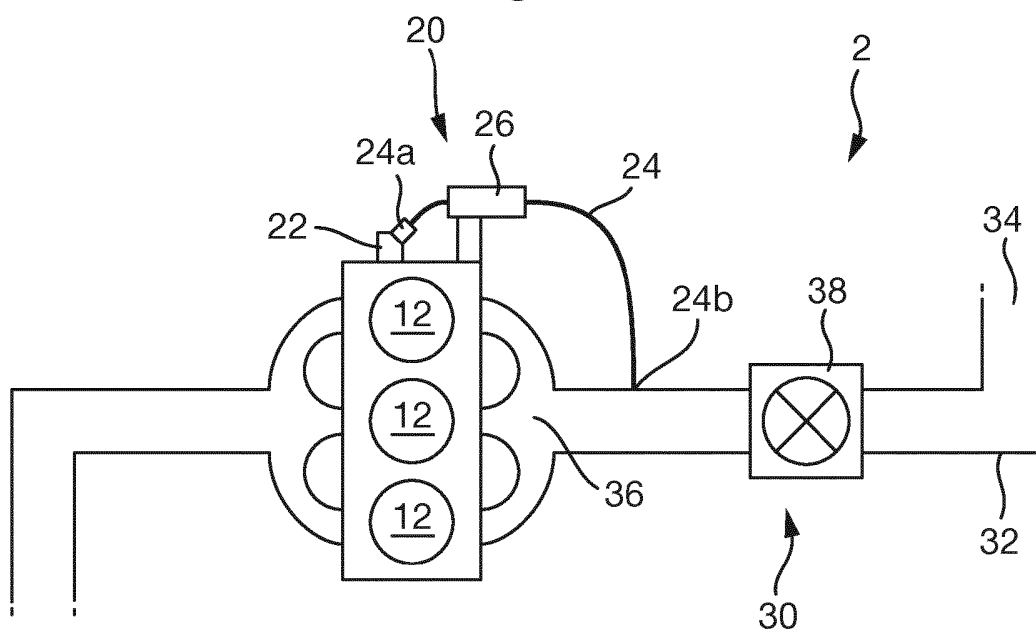


Fig. 3a

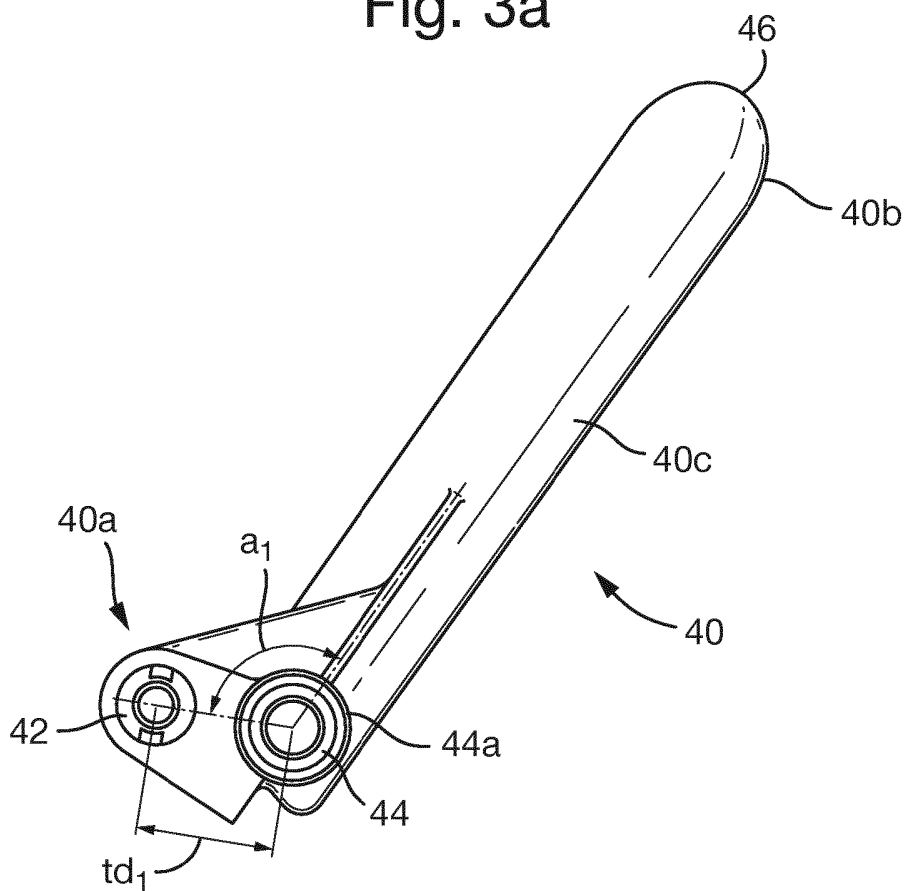


Fig. 3b

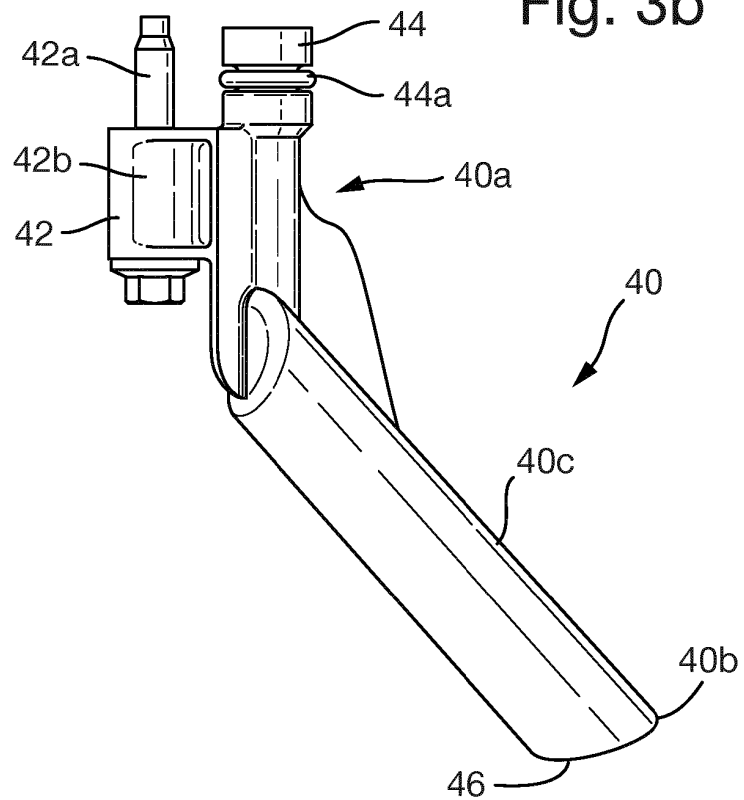


Fig. 3c

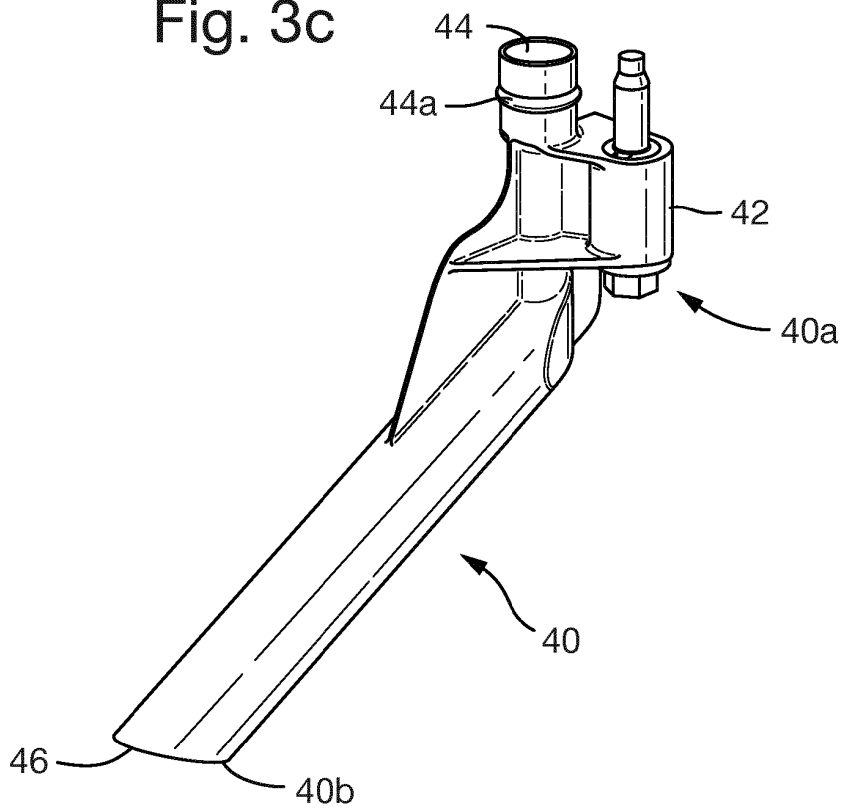


Fig. 4

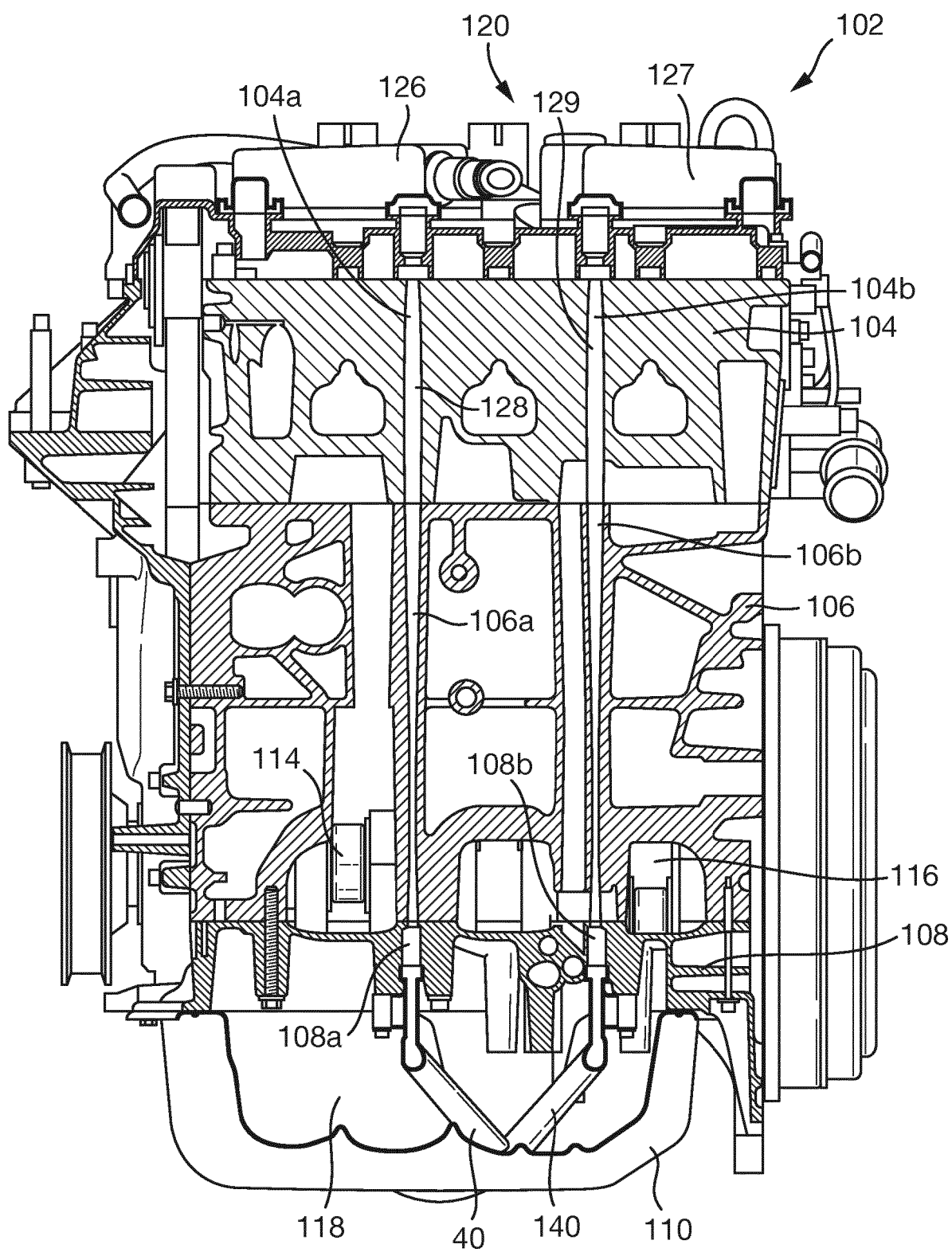


Fig. 5

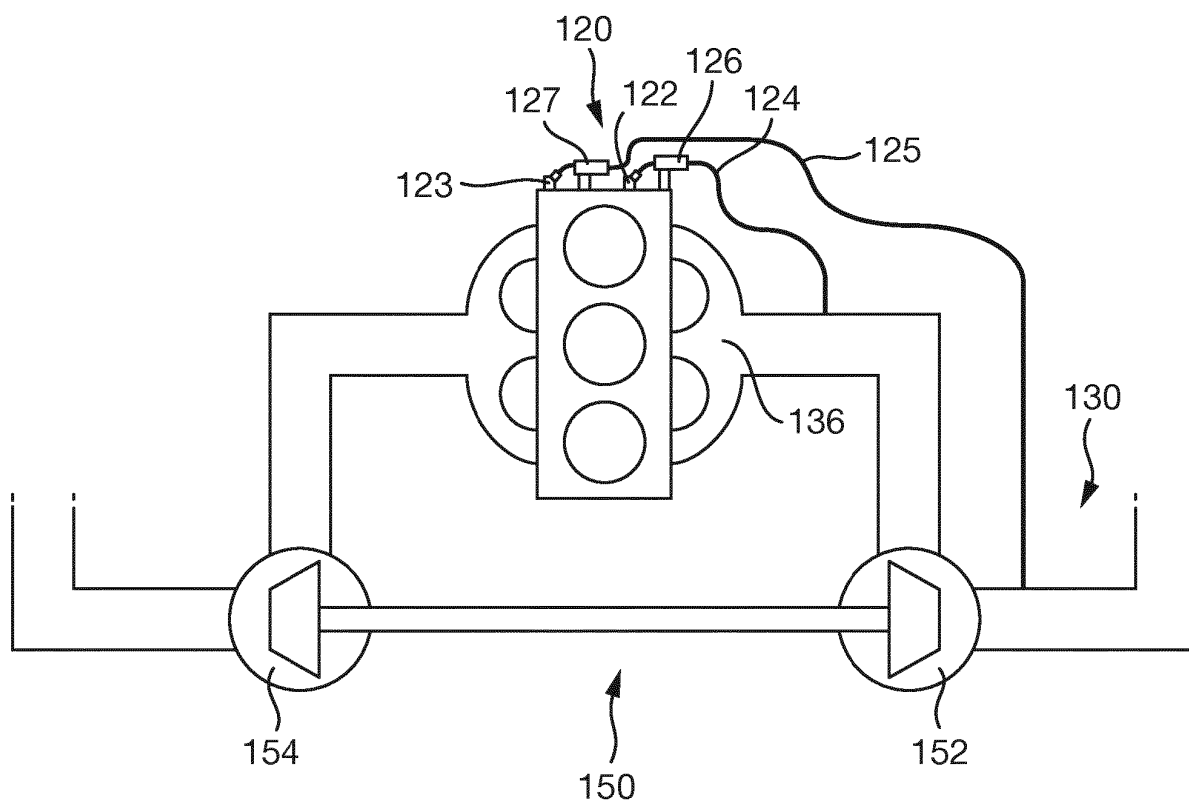


Fig. 6a

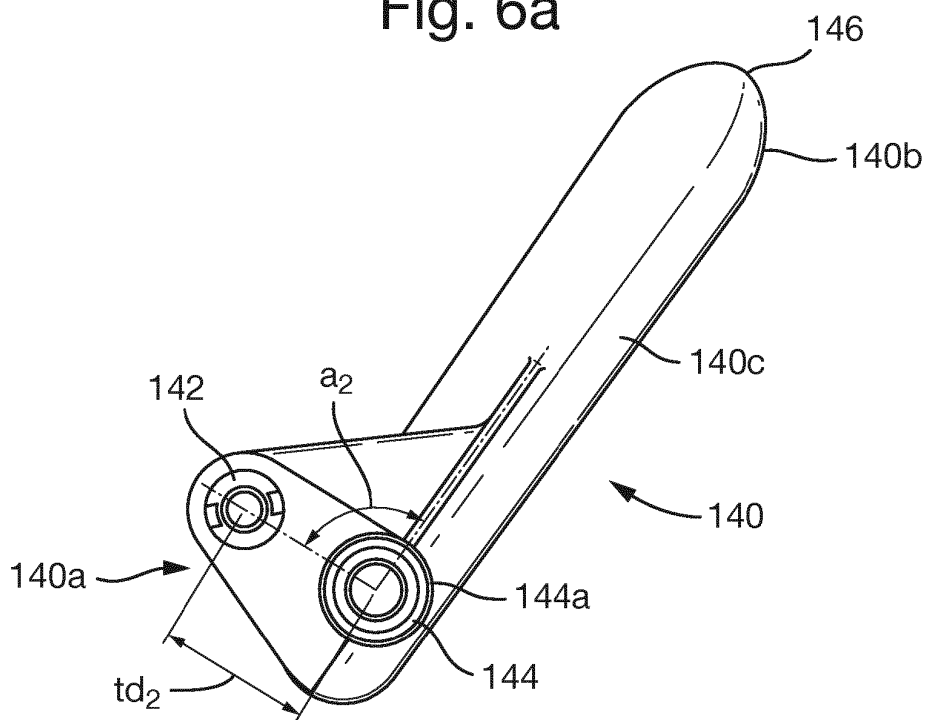


Fig. 6b

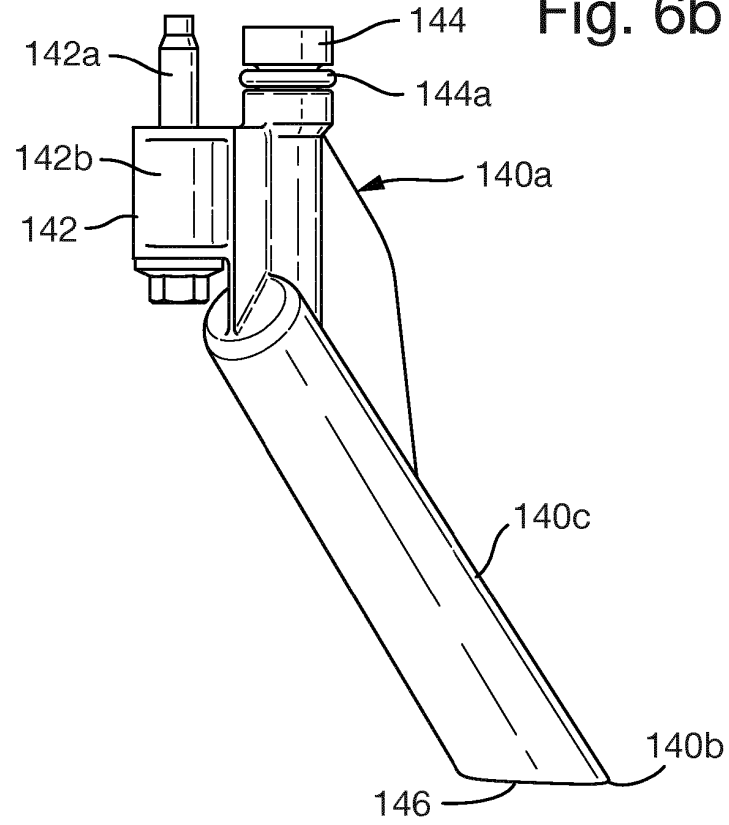


Fig. 6c

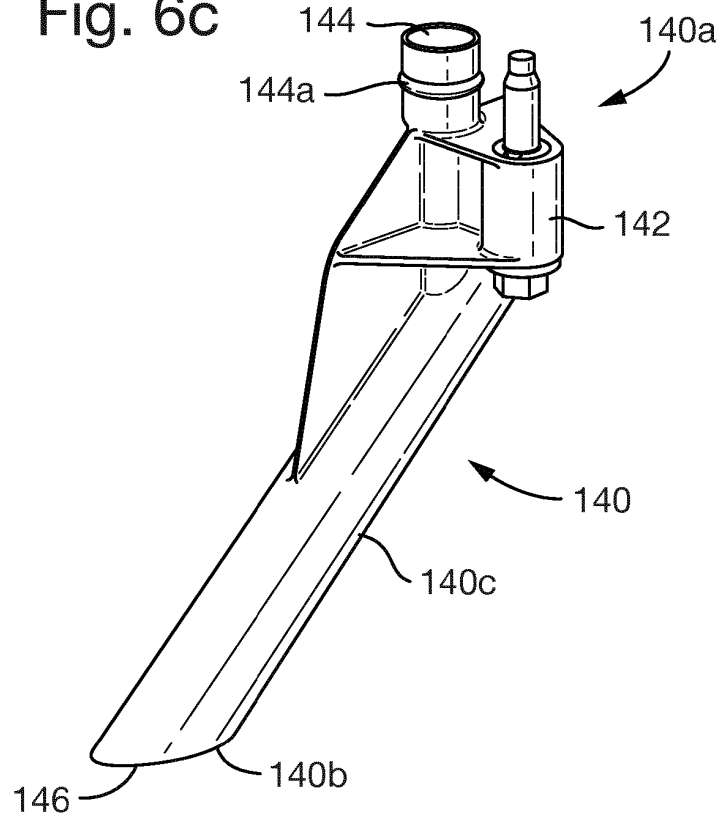


Fig. 7

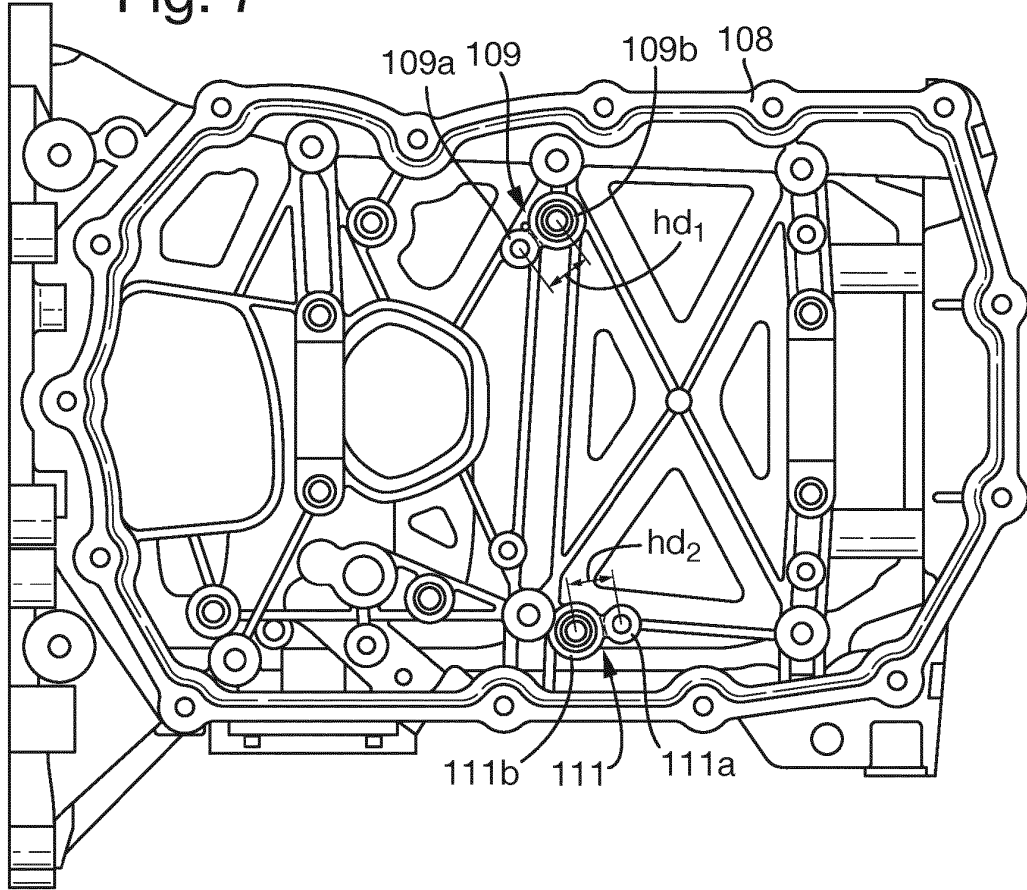
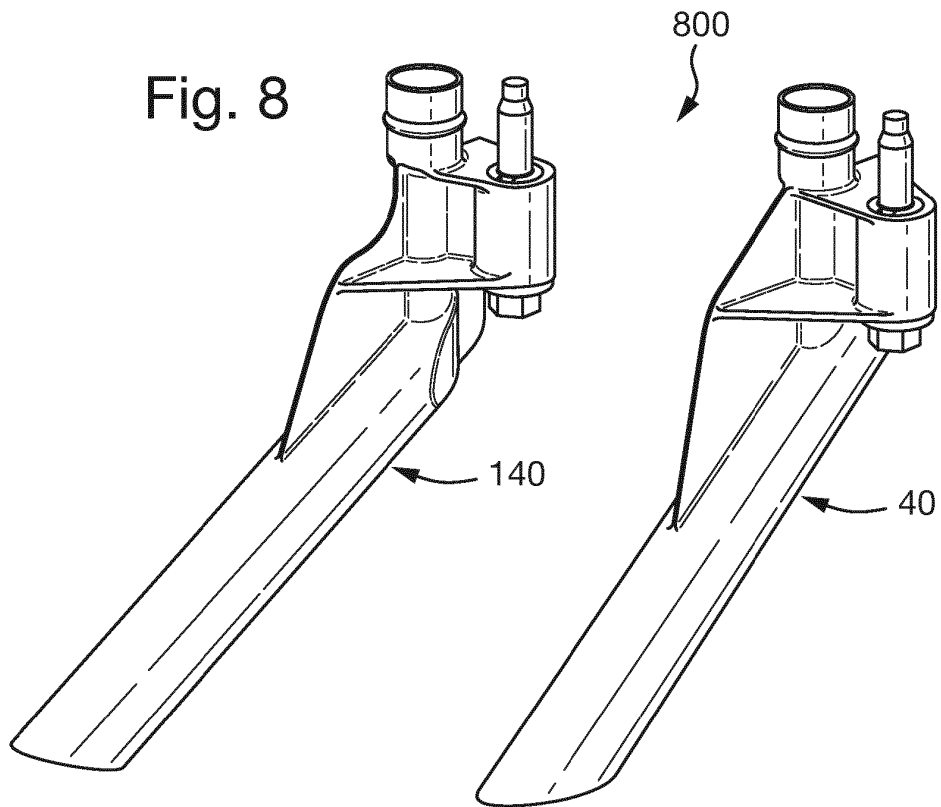


Fig. 8



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0599095 A [0006]